Biomedical Division

INSTRUCTION MANUAL

SORVALL® GLC-3 GENERAL LABORATORY CENTRIFUGE

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INSTRUCTION MANUAL

SORVALL GLC-3 GENERAL LABORATORY CENTRIFUGE

Du Pont Company
Instrument Products
Biomedical Division
Newtown, Connecticut 06470

DuPont Instruments

Issue Date: JUNE 1977

This manual is a guide for the use of the

GLC-3 General Laboratory Centrifuge

Data herein has been verified and validated and is believed adequate for the intended use of the instrument. If the instrument or procedures are used for purposes over and above the capabilities specified herein, confirmation of their validity and suitability should be obtained, otherwise Du Pont does not guarantee results and assumes no obligation or liability. This publication is not a license to operate under, or a recommendation to infringe upon, any process patents.

Notes, cautions, and warnings within the text of this manual are used to emphasize important and critical instructions.

WARNING: An operating procedure, practice etc, which if not correctly followed, could result in personal injury.

CAUTION: An operating procedure, practice, etc, which, if not strictly observed, could result in damage of equipment.

NOTE: An operating procedure, condition, etc, which it is essential to highlight.

Health hazards precaution data. If and when hazardous chemicals or adverse health factors affect the environment or use of the equipment, appropriate precautions are provided.

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WARRANTY

The GLC-3 Centrifuge is warranted to be free from defects in materials and workmanship for a period of one year. Du Pont will repair or replace and return free of charge any part which is returned to its factory within said period, transportation prepaid by the user, which is found on inspection to have been defective in materials or workmanship. For the first 90 days, both parts and service are without charge. For the balance of the period, necessary parts will be provided without charge, but service will be charged at established labor and travel rates. This warranty does not include parts that by their nature are not intended to last for one year. This specifically includes the Carbon Brush Assembly, PN 61924.

This warranty does not include wear from normal use. This specifically pertains to the motor and drive assemblies.

The warranty does not apply to any instrument or part thereof which has been altered by anyone other than an employee of Du Pont, nor to any instrument thereof which has been damaged through accident, negligence, failure to follow operating instructions, the use of electric currents or circuits other than those specified on the plate affixed to the instrument, misuse, or abuse.

Du Pont reserves the right to change, alter, modify, or improve any of its instruments without any obligation whatever to make corresponding changes to any instrument previously sold or shipped.

The foregoing obligations are in lieu of all other obligations and liabilities including negligence and all warranties, of merchantability or otherwise, expressed or implied in fact or by law, and state our entire and exclusive liability and buyer's exclusive remedy for any claim of damages in connection with the sale or furnishing of goods or parts, their design, suitability for use, installation, or operation. Du Pont will in no event be liable for any special or consequential damages whatsoever, and their liability under no circumstances will exceed the contract price for the goods for which liability is claimed.

Figure 1-1. GLC-3 General Laboratory Centrifuge

Section 1 DESCRIPTION

1-1. SCOPE

This manual contains the information necessary to install, operate, and maintain the SORVALL GLC-3 General Laboratory Centrifuge, hereafter referred to as the centrifuge. In addition, a replaceable parts list is provided.

1-2. PURPOSE

The purpose of the centrifuge is to separate substances of different densities, to remove moisture, or to increase gravitational effects by centrifugal force.

1-3. DESCRIPTION

The centrifuge, figure 1-1, uses a motor to drive a rotor. The rotor drive is a gyro-action, self-centering drive with a keyway to prevent slippage. See paragraph 1-5 for ordering specific rotors and accessories.

The housing is a cast aluminum-alloy base with steel rotor guard chamber. The full-access rotor chamber lid is counterbalanced for easy opening and safe closing. The lid latch is locked in place by a motor operated lid-latch plunger. This safety feature prevents centrifuge operation until the lid is mechanically and electrically locked. It also prevents opening the lid when the rotor is spinning.

In addition, an "overspeed" device will detect when a rotor exceeds the rated angular velocity (3400 rev/min) and will shut the machine down automatically.

The control panel is integrated into the unit as part of the base and contains the operating controls and indicators. All controlling and operating circuits are contained in the base.

The unit is finished with stain-resistant, baked-on epoxy enamel.

1-4. SPECIFICATIONS

Refer to table 1-1 for centrifuge specifications.

1-5. EQUIPMENT REQUIRED

In addition to the centrifuge, rotors and rotor accessories are required for laboratory use. Refer to the GLC-3 Brochure for optional rotors and rotor accessories.

Table 1-1. Specifications

Rotor	Maximum Operating Angular Velocity (revolutions per minute)	Maximum Relative Centrifugal Force (RCF)
HL-4 with omni-carrier	3400	2120
HL-4 with 50-ml bucket	3400	2340
HL-4 with 100-ml bucket	3400	2644
HL-4 with sealed bucket assy	3400	2340
M	3400	1590
SP/X	3400	1590

Operating Temperature Range	0 °C to 25 °C			
Electrical Requirements:				
Potential	115 V	single-phase	or 220 V	single-phase
Current	8A		or 4A	
Frequency	60 Hz		or 50 Hz	

Dimensions:	
Width	45 cm (17.5 in)
Depth	43 cm (17.0 in)
Height	46 cm (18.0 in)
Mass (weight)	18 kg (40 lb)

Section 2 INSTALLATION

2-1. GENERAL

This section provides information necessary to unpack, inspect, and install the centrifuge prior to operation.

2-2. UNPACKING

The centrifuge is shipped in a specially-designed heavy-duty cardboard carton to prevent damage in shipping.

Unpack carefully. In the event that parts are missing or broken, notify both the carrier and Du Pont immediately.

2-3. INSTALLATION

The centrifuge has been ordered with specific power requirements and should be used only on appropriate service lines. These are:

105 — 125 Vac, 60 Hz, single phase, 8 A

or

210 — 230 Vac, 50 Hz, single phase, 4 A (export only)

The 3-wire cord with a 3-prong plug will fit Hubbell receptacle number 5261 (115 Vac parallel blades), number 5561 (220 Vac tandem blades), or equivalent.

The centrifuge may be placed on any sturdy table or bench. Once positioned, it is ready for inspection and operation since it has been tested and adjusted prior to shipment.

CAUTION

Cooling air is drawn into the cabinet from all four sides of the base. Be sure the entrances are not obstructed.

Connect the power cord to the 3-wire grounded receptacle and refer to operation instructions.

2-4. CONTAMINATION

Because of the nature of samples likely to be processed in the rotor, the chance of contamination, either biological or radioactive, is very possible. Always be aware of this possibility and take normal precautions. Use standard decontamination procedures should exposure occur.

Should a centrifuge or rotor that has been used with radioactive or pathogenic material require servicing by Du Pont personnel either at the customer's laboratory or at Du Pont facilities, comply with the following procedure to ensure safety of our personnel.

a. Clean the centrifuge and/or rotor to be serviced of all encrusted material and decontaminate it prior to servicing by our representative. There must be no radioactivity detectable by survey equipment.

b. Complete and attach Decontamination Information Certificate (Du Pont Instruments Form No. IPDP-59) to the centrifuge or rotor.

If centrifuge or rotor to be serviced does not have a Decontamination Information Certificate attached and, in our opinion, presents a potential radioactive or biological hazard, our representative will not service the equipment until proper decontamination and certification is complete. If we receive a centrifuge or rotor at our Service facilities which, in our opinion, is a radioactive or biological hazard, the sender will be contacted for instructions as to disposition of the equipment. Disposition costs will be borne by the sender.

Decontamination Information Certificates are included with these instructions. Additional certificates are available from your local technical or customer service representative. In the event these certificates are not available, a written statement certifying that the unit has been properly decontaminated and outlining the procedures used will be acceptable.

NOTE

Service representative will annotate a Customer Service Repair Report if decontamination was required, and if so, what the contaminate was and what procedure was used. If no decontamination was required, it will be so stated.

Section 3 OPERATION

3-1. GENERAL

This section locates and describes the function of each operating control and indicator and provides the data needed to start up, operate, and shut down the centrifuge.

Since rotor balance is an operational consideration, it and the selection and use of centrifuge tubes are discussed.

3-2. ROTOR CONSIDERATIONS

Since the rotor is an essential part of centrifugation, there are two very important considerations of rotor operation: temperature and balance.

a. Rotor Temperature

Rotor temperature rise accompanies any type of centrifugation. The design of the GLC-3 with its large rotor chamber minimizes the temperature increase. The increase in temperature is due to a number of variables such as ambient temperature within the chamber, rotor speed, length of run, and tube holder and specimen temperature.

When running temperature-sensitive material, experimentation must be done first.

b. Rotor Balance

For best performance, the rotor mass including trunnion rings, holders, tubes, and specimen must be properly balanced. If the rotor is improperly balanced, an unbalance switch will trip the POWER circuit breaker, removing input electrical potential and allowing the rotor to coast to a stop.

If less than a full complement of specimen tubes is being run, they must be placed in opposite rotor compartments. Tubes filled with water may be used to balance the rotor as required.

To assist in balancing, the trunnion rings are stamped with their gram mass. If an additional trunnion ring is ordered, its gram mass must be specified or they must be ordered in matched pairs.

Balance a rotor as follows:

(1) Always load the rotor with an equal opposing mass. This includes trunnion ring, holder, tube, and specimen quantity.

(2) If it is not possible to load rotor with an opposing specimen mass, use a trunnion ring, holder, and tube filled with water to equal the specimen.

(3) Balance each opposing pair of holders individually.

WARNING

(4) If the HL-4 rotor is used, suitable bucket and trunnion combinations must be carried in all four locations. With 50-ml buckets or the omni-carrier with inserts, both buckets and inserts must be balanced. This prevents the bucket or carrier from attempting to find its center of mass during centrifugation which may affect its horizontal operation (figure 3-1). Use a balance tube or tubes to prevent this possibility.

3-3. SELECTION AND USE OF CENTRIFUGE TUBES

A wide variety of tubes may be used with the HL-4 rotor but particular attention should be paid to the length of tube. Because of the configuration of the rotor and the arc through which the tubes will swing, there is a limit to tube length with each bucket and insert (figure 3-2).

Rubber pads must be used with the 100-ml and 50-ml buckets when running glass centrifuge tubes to prevent tube breakage.

3-4. LOADING PRECAUTIONS

When using the omni-carriers, make certain that the inserts are fully seated in the holder, otherwise damage may result.

Because oversized tubes occasionally will be found from any manufacturer, it is recommended that tubes be test-fitted to the rotor compartment (or

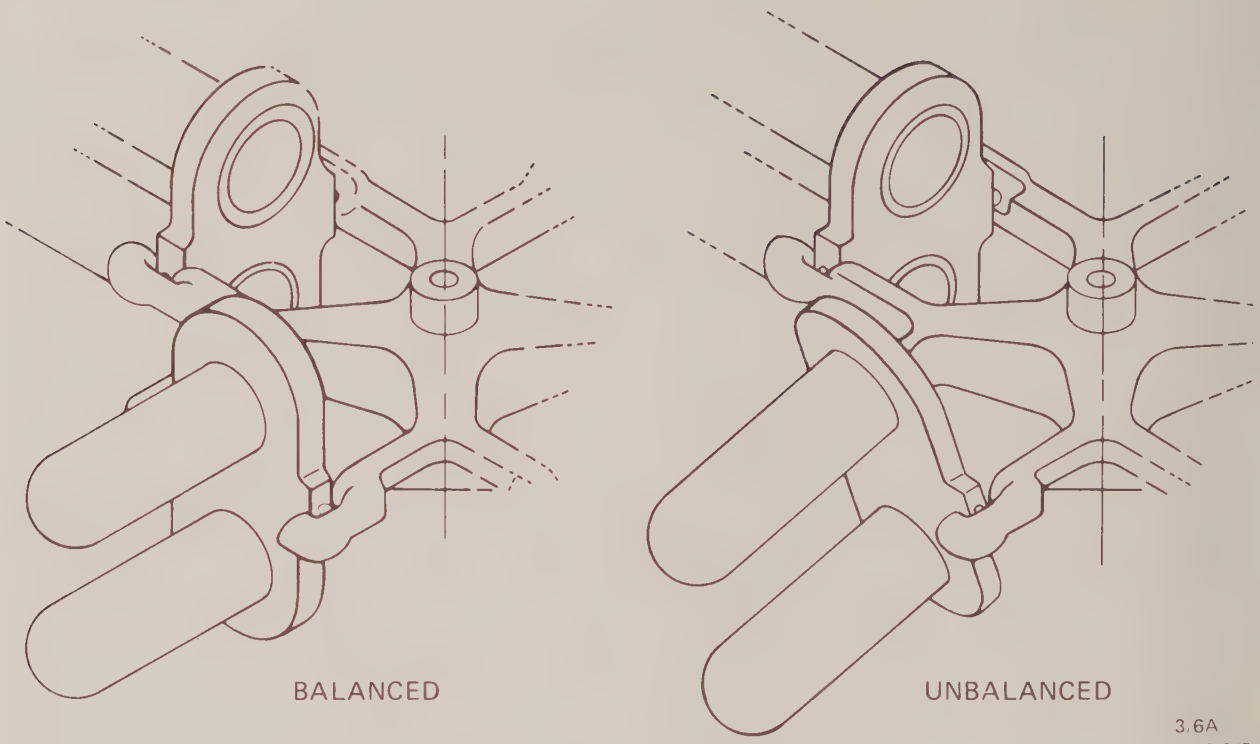


Figure 3-1. Improperly Balanced Bucket

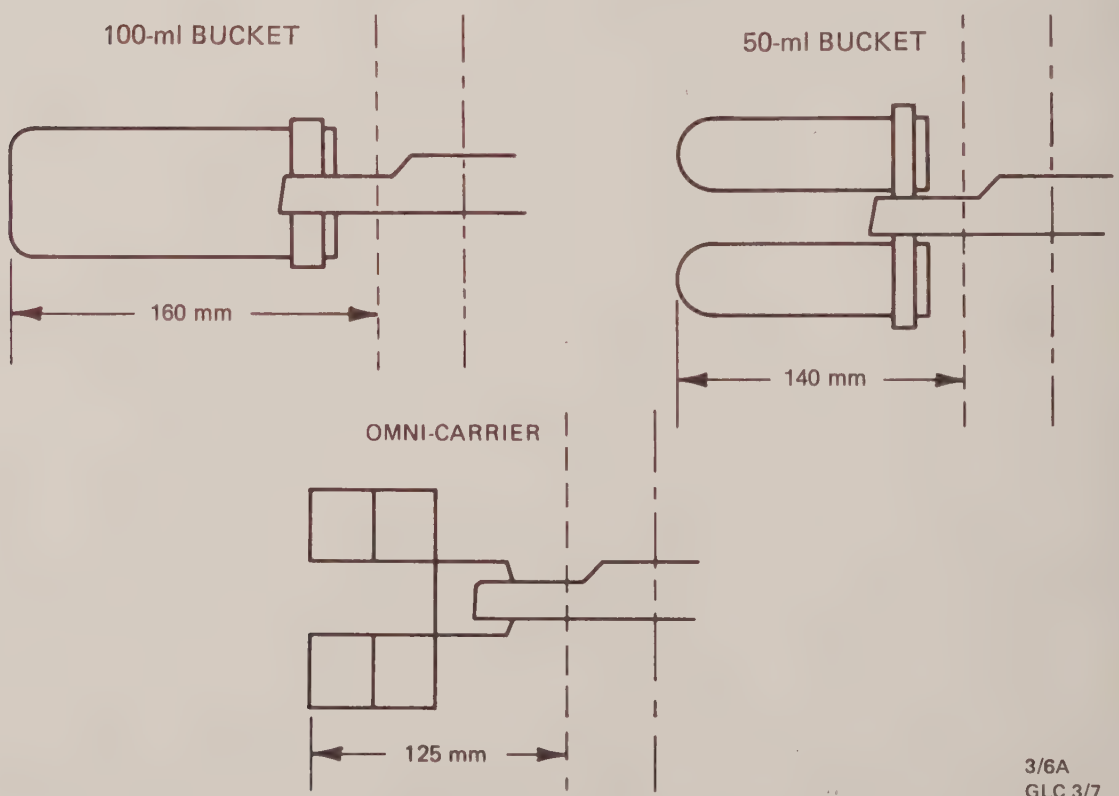


Figure 3-2. Tube Length Limits

insert) to ensure proper fit prior to filling with specimen.

3-5. CONTROLS AND INDICATORS

Figure 3-3 shows the operating controls and indicators. Table 3-1 lists them by item number and describes their function.

3-6. OPERATION

With the centrifuge installed as described in Section 2, operate it as follows:

CAUTION

To avoid shortening the motor drive assembly life, never operate the rotor at its critical angular velocity (approximately 1000 rev/min) for any length of time.

a. Set the POWER switch ON and turn the TIMER to OFF. This activates and retracts the safety lid interlock.

NOTE

There is a delay of about ten seconds between activation and retraction.

b. Unlock the lid latch and raise the lid.

c. Inspect the interior of the guard assembly and remove any foreign objects.

d. Select the rotor to be used and place it on the motor drive shaft within the guard assembly.

CAUTION

Make sure that the keyway in the rotor is properly engaged in the keyway on the drive shaft.

e. Load the rotor with the specimen tubes. Refer to paragraph 3-3.

Table 3-1. Function of Controls and Indicators

Item No.	Name	Position	Function
1.	POWER switch	ON and OFF	Applies mains power to circuits, shuts power off. Switch is illuminated when power is on.
2.	TIME control	a. HOLD	At HOLD, the timing circuit is bypassed and the drive motor runs until the TIME control is set to OFF. At OFF, the lid will unlock after the rotor stops.
		b. 0 to 30	The TIME control may be set to any time between 0 and 30 minutes. The drive motor will run for the period of time selected and the timer contacts will open (times out) to stop timer and drive motors. At OFF, the lid will unlock after the rotor stops.
3.	LID light		Indicates when the run is completed, the interlock is released, and the latch can be opened.
4.	Tachometer		Indicates the drive motor "speed". The smallest division is equal to 100 revolutions per minute.
5.	ANGULAR VELOCITY control	0 to 10	Selects ranges of drive motor angular velocity from 0 to 10. These are arbitrary number units for reference only. Observe "speed" on tachometer.
6.	BRAKE Control	ON and OFF	Selects brake or coast when timer goes to 0.

Figure 3-3. Controls and Indicators.

10/7-2
GLC-3/8

CAUTION

The centrifuge must not be operated without the rotor installed and properly balanced. An unbalance interlock switch will short out the input voltage and trip the POWER circuit breaker if unbalance settings are exceeded.

f. Close the counterbalanced lid and lock the lid latch. Be certain the timer is off and the latch pin is in the retracted position.

g. Preset the ANGULAR VELOCITY control to 0.

NOTE

Presetting the ANGULAR VELOCITY control to 0 will prolong the life of the control relay.

h. Turn the TIME switch to the desired time. If a time greater than 30 minutes is required, turn the TIME switch to HOLD. The light above the tachometer will go on when the timer is set in the TIME or HOLD positions, indicating that the centrifuge is set to operate. The safety lid interlock will extend and the drive motor will start if the lid is down and properly latched. If the ANGULAR VELOCITY control is not preset to 0, a slight momentary rotation of the rotor may occur at this point. This is a normal condition.

i. Set the BRAKE switch to ON or OFF.

j. Adjust the ANGULAR VELOCITY CONTROL for the desired "speed".

CAUTION

Maximum rotor "speeds" are:

Rotor	Angular Velocity (revolutions per minute)
HL-4, 50-ml bucket	3400
HL-4, 100-ml bucket	3400
HL-4, omni carriers	3400
M	3400
SP/X	3400

NOTE

The centrifuge has been set such that with the ANGULAR VELOCITY control in full open position, number 10 on the "speed" dial, the HL-4 rotor with omni-carrier will run at 3400 rev/min. In the case of any other rotor or the HL-4 rotor with bucket combinations, the ANGULAR VELOCITY control knob must be positioned to prevent the "speed" from going over 3400 rev/min since the centrifuge is equipped with an "overspeed" detection device that will automatically shut down the centrifuge when the angular velocity reaches 3620 ±20 rev/min.

Table 3-2. Relative Centrifugal Force

ROTOR	MAXIMUM RADIUS
HL-4 Rotor with:	
50-ml Bucket	18.11 cm
Sealed 50-ml Bucket	18.11 cm
100-ml Bucket	20.47 cm
Omni-Carrier	16.41 cm
M&SP/X	12.32 cm

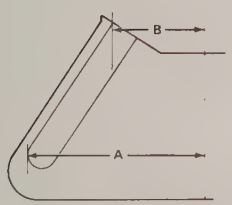
ANGULAR VELOCITY IN REV/MIN	RADIUS (centimeters) 12.32	16.41	18.11	20.47
500	34	46	51	57
1000	138	183	202	229
1500	310	413	455	515
2000	551	733	809	915
2500	860	1146	1265	1430
3000	1239	1650	1821	2059
3500	1686	2246	2479	2802
4000	2202	2933	3238	3660
4500	2787	3713	4098	4632
5000	3441	4583	5059	5719
5500	4164	5546	6121	6919
6000	4955	6600	7285	8235

FORMULA USED

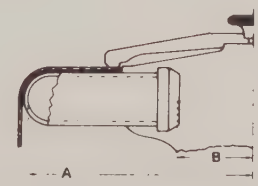
To determine RCF points not given on the charts, use the formula given below.

$RCF = \alpha r \left(\frac{\omega}{1000}\right)^2$, where $\alpha = 11.17\ min^2/cm$, r = radius in centimeters and ω = angular velocity in revolutions per minute

Table 3-3. Maximum Compartment Mass



ANGLE ROTORS		RADIUS (CENTIMETERS) A	B	MAXIMUM COMPARTMENT MASS (GRAMS)
M	inner row	9.14	5.64	27
	outer row	12.32	7.59	
SP/X	inner row	8.23	4.65	115
	outer row	12.32	7.59	



HORIZONTAL ROTORS		RADIUS (CENTIMETERS) A	B	MAXIMUM COMPARTMENT MASS (GRAMS)
HL-4	50-ml	18.11	8.25	650
	100-ml	20.47	7.75	550
Omni-carrier		16.41	9.84	815
Sealed 50-ml Bucket		18.11	8.59	450

k. Before the timer runs out, the run may be terminated by returning the timer to zero. The light above the tachometer will go on when the timer is set at zero and the interlock is released.

NOTE

When the timer is in operation and then manually returned to OFF, the unit will not restart when a new speed is selected until the rotor comes to a stop.

NOTE

There is a delay of about ten seconds between activation and retraction.

l. At the end of a run, for which either the preset time had elapsed or which was manually terminated, the rotor will either brake to zero (if the brake has been preset ON) or coast to zero. When the rotor reaches zero "speed", the safety lid interlock will be activated and will retract automatically.

m. The safety lid interlock is retracted when the LID light is illuminated, indicating that the latch can be opened and the rotor and/or contents can be removed.

n. After the run has ended, secure the centrifuge as follows:

(1) Leave the POWER switch ON.

(2) Close the lid and lock the latch.

(3) Set the POWER switch OFF.

Section 4 MAINTENANCE

4-1. GENERAL

This section provides data needed to maintain and troubleshoot the centrifuge. Procedures include testing, cleaning, and troubleshooting. Most parts can be replaced without special procedures. Should maintenance beyond the scope of this manual be necessary, contact the nearest office of Du Pont Instruments, Biomedical Division.

WARNING

Because of the inherent hazard involved with electrical circuits, untrained personnel must not attempt to test or repair any electrical circuits in the centrifuge.

Schematic (figure 4-1) and wiring diagrams (figure 4-2) are included as diagnostic aids in troubleshooting.

An exploded view (figure 5-1) provides parts identification.

4-2. TEST EQUIPMENT REQUIRED

No special test equipment is required. A general purpose multimeter and common handtools are sufficient.

4-3. INSPECTION AND CLEANING

Inspect the centrifuge weekly for any signs of wear, corrosion, or accumulation of dirt. Wipe its exterior clean with a cloth dampened with warm water and a mild soap or detergent. Remove the rotor. Wipe the interior of the guard bowl clean.

Wash the rotor with warm water and a mild soap or detergent. It is important to wash the rotor after any spills. Remove any caustic or acid materials with a detergent such as Ninon or Alconox and stiff bristle brush and rinse rotor well. After rinsing, dry thoroughly with a soft absorbent cloth or towel. Store the M and SP/X rotors and the stainless steel holders upside down.

4-4. TROUBLESHOOTING

A troubleshooting chart is provided in the rear of this section to isolate a faulty component. If any problems arise in replacing and/or adjusting a component, contact the nearest office of Du Pont Instruments, Biomedical Division.

Refer to Section 5 for the part number of the replacement part.

4-5. UNBALANCE SWITCH ADJUSTMENT (figure 4-3)

a. Install an HL-4 rotor with 100-ml buckets in the rotor guard.

b. Place a 10-gram mass in one of the buckets.

c. Remove the front panel.

d. Adjust the rev/min to 1000.

e. While the motor "speed" is increasing adjust the unbalance adjusting screw until the unbalance switch opens at 1000 rev/min ±500.

f. Stop the rotor.

g. Replace the 10-gram mass with an 8-gram mass.

h. Adjust the rev/min to 1000. The unbalance switch should not open with the 8-gram mass. If it does, repeat steps d thru h until the 8-gram mass does not open the switch.

4-6. PULSE GENERATOR ADJUSTMENT (figure 4-4)

a. Tilt the centrifuge over and remove the four screws and rubber feet.

b. Remove the other three baseplate screws and washers. Remove the base.

c. Insert a 0.051 cm (0.020-in) feeler gauge between the pickup and the high points of the tachometer gear.

d. If necessary, loosen the two screws holding the pickup, reposition it as required, and tighten the screws.

e. Install the baseplate with the seven screws and washers and the four rubber feet.

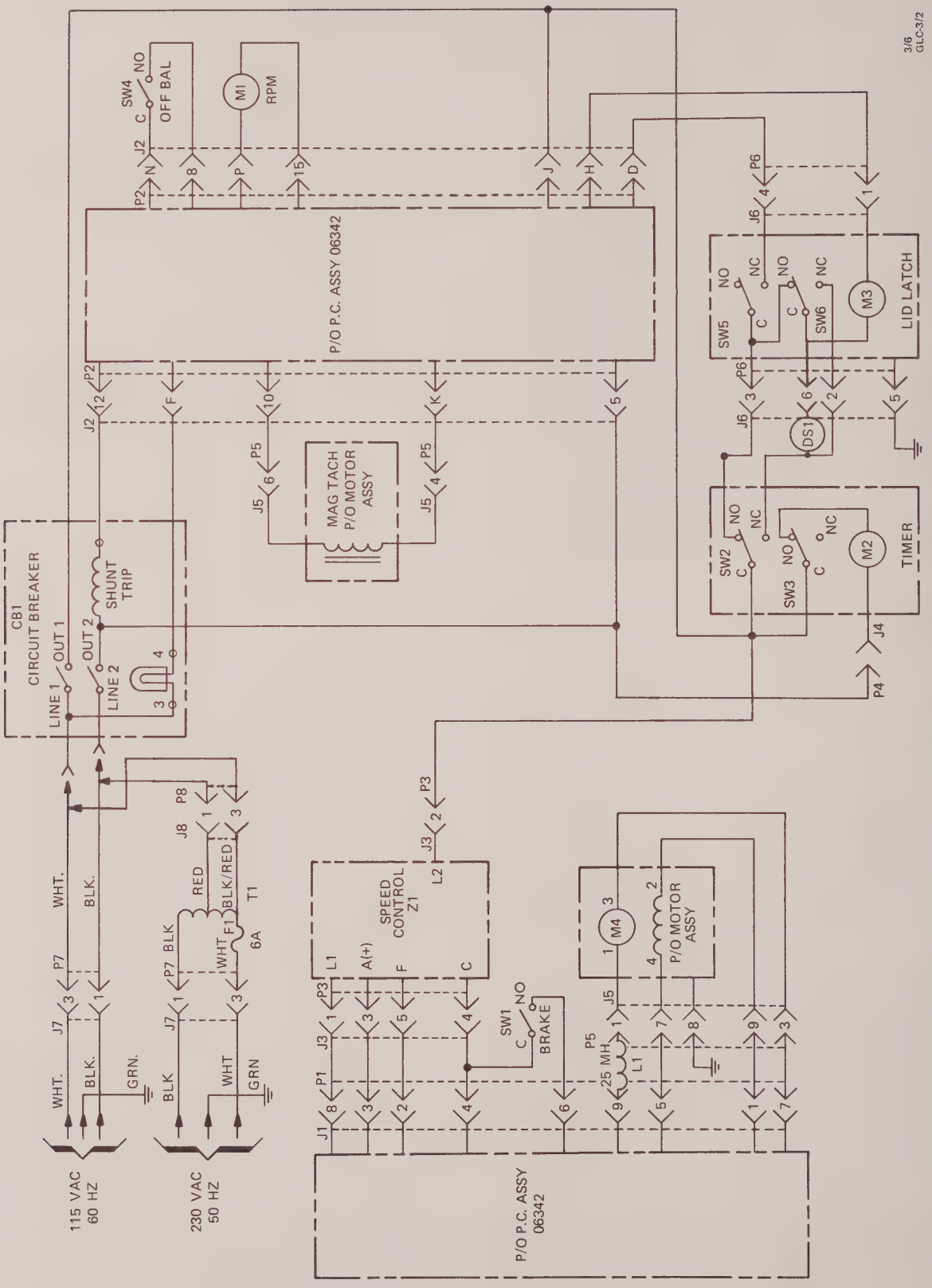


Figure 4-1. Schematic Diagram (Sheet 1 of 2)

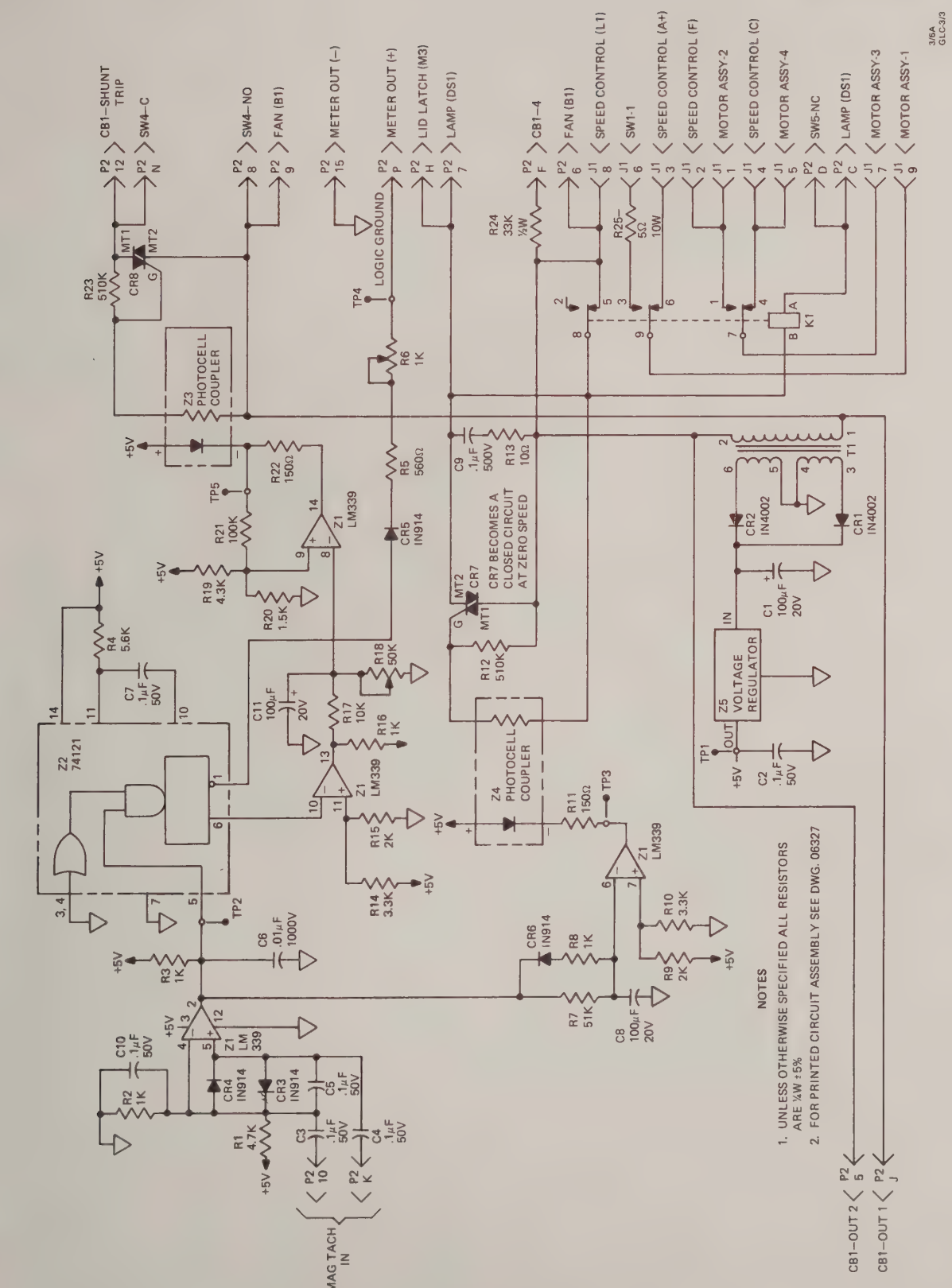


Figure 4-1. Schematic Diagram (Sheet 2 of 2)

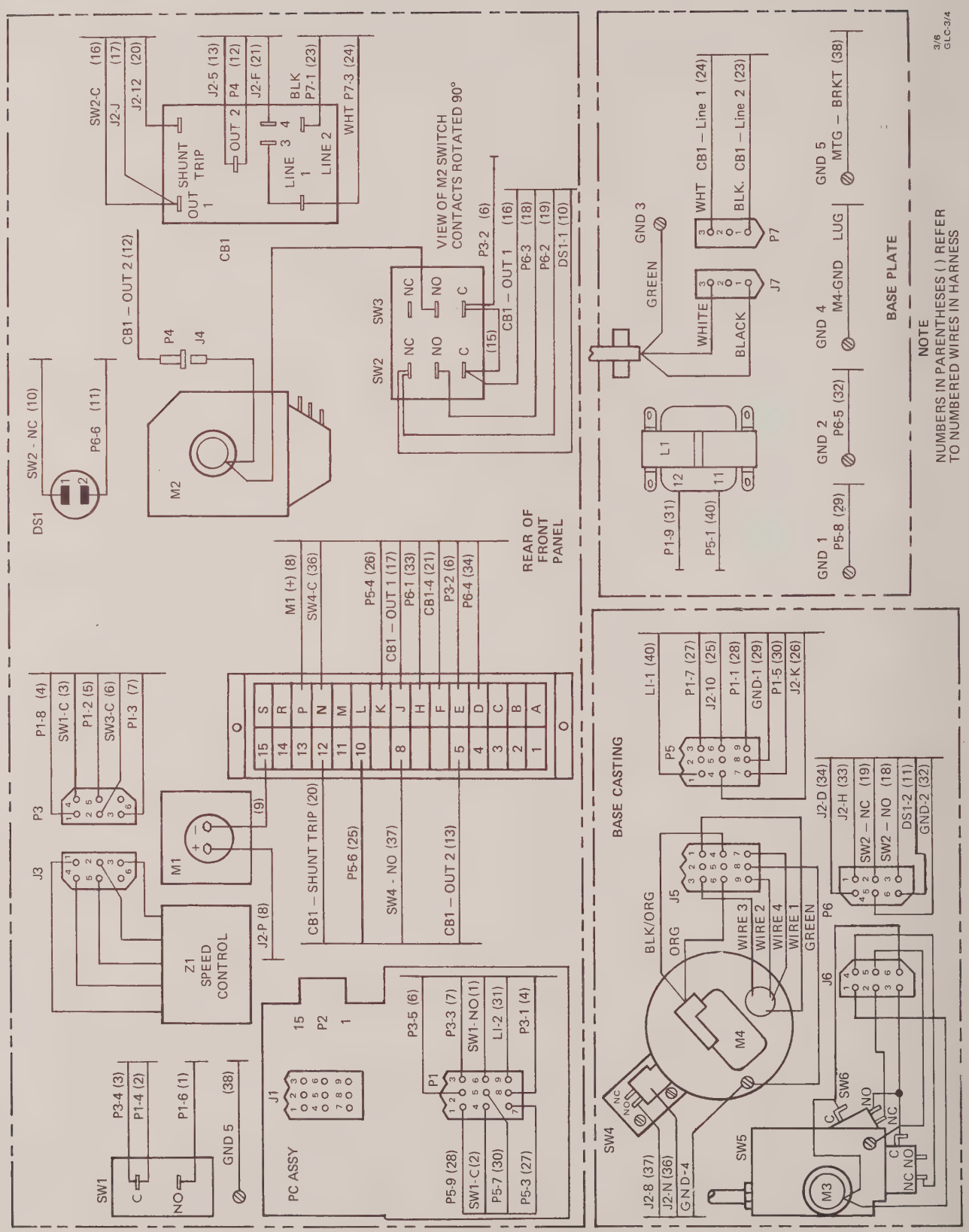


Figure 4-2. Interconnecting Diagram

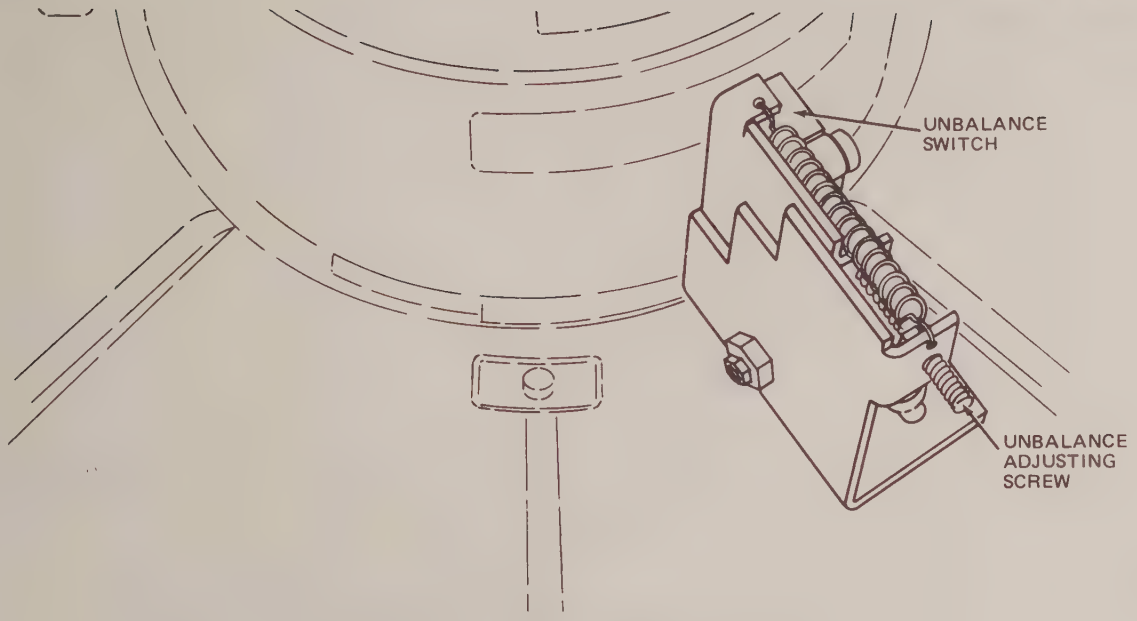


Figure 4-3. Unbalance Switch Adjustment

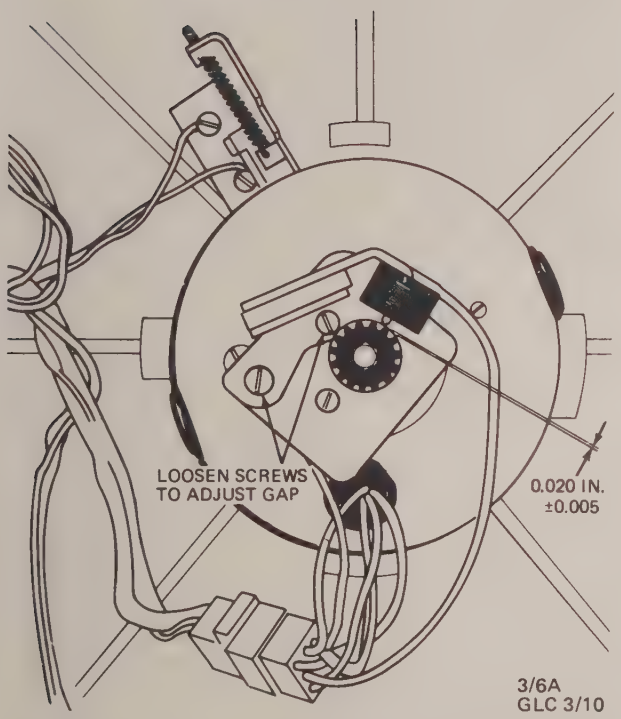


Figure 4-4. Pulse Generator Adjustment

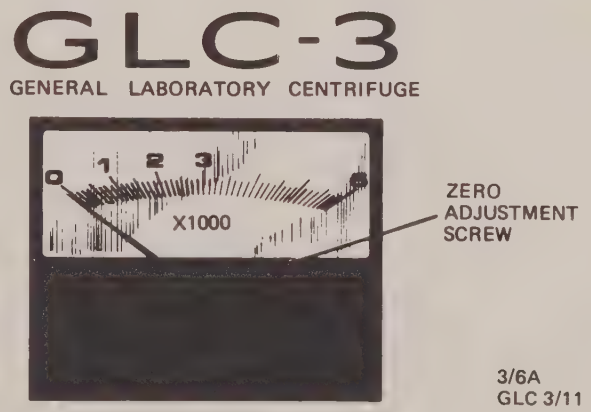


Figure 4-5. Zero Adjustment

4-7. TACHOMETER ZERO ADJUSTMENT (figure 4-5)

With the POWER switch OFF, adjust screw until the pointer reads 0.

4-8. LOW ANGULAR VELOCITY POTENTIOMETER ADJUSTMENT (figure 4-6)

a. Connect the centrifuge to a power source through a variable transformer.

b. Adjust the variable transformer for 115 V (domestic) or 220 Vac (export).

c. Place a rotor on the gyro-drive assembly and close the cover.

d. Remove the front panel.

e. Turn the ANGULAR VELOCITY control to 0.

f. Observe the motor under the guard bowl.

g. If the motor is not turning, turn the screw (R10) clockwise until the motor just starts to turn. Then turn the screw counterclockwise until the motor stops.

h. If the motor is turning, turn the screw (R10) counterclockwise until the motor stops.

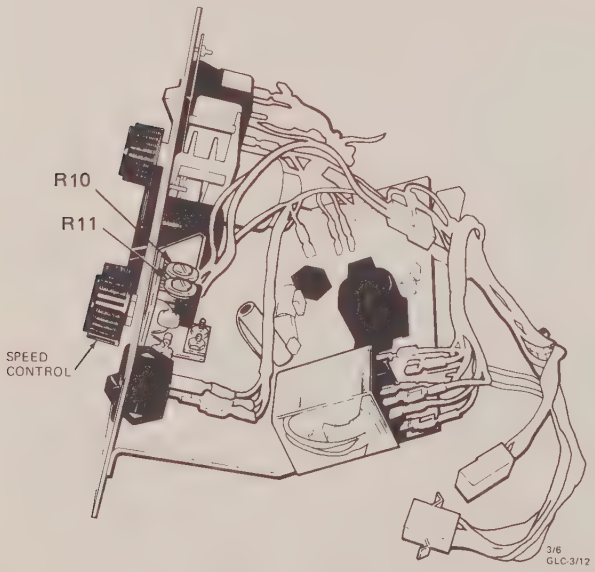


Figure 4-6. "Speed" Control Adjustment

4-9. HIGH ANGULAR VELOCITY CONTROL POTENTIOMETER ADJUSTMENT (figure 4-6)

a. Connect the centrifuge to a power source through a variable transformer.

b. Adjust the variable transformer for 115 V (domestic) or 220 Vac (export).

c. Place a rotor on the gyro-drive assembly and close the cover.

d. Remove the front panel.

e. Turn the ANGULAR VELOCITY control to 0.

f. Turn screw (R11) counterclockwise.

g. Place the HL-4 rotor with omni-carriers on the gyro drive.

h. Turn ANGULAR VELOCITY control knob to 10.

i. Turn screw (R11) clockwise until "speed" reaches 3400 rev/min on the tachometer.

j. Turn off centrifuge.

k. Replace front panel.

4-10. MOTOR BRUSH INSPECTION AND REPLACEMENT (figure 5-1)

a. Unplug the instrument power cord.

b. Tilt the centrifuge over on its back.

c. Remove the four screws and the rubber feet.

d. Remove the other three baseplate screws and washers. Remove the base.

e. Remove the plastic brush caps with a stubby screwdriver. Pull the brushes from their holders, noting orientation.

NOTE

Before inserting replacement brushes, carbon accumulation should be removed from the area of the brush holder in which the brush rides. Brush should then move freely in the brush holder.

(1) If the brush length is greater than 9 mm (3/8 in), replace the brushes in their original brush tubes with the same orientation.

Length Measurement

(2) If the brush length is less than 6 mm (1/4 in), the brushes must be replaced. If the brushes are badly pitted or worn unevenly, or if the commutator is badly grooved, the armature should be reconditioned or replaced. For information and/or instructions on armature reconditioning, contact the Du Pont Service Department in Newtown, Conn.

f. Install the plastic brush caps. Make sure the brush spring retainer 'ears' are seated in the brush holder slots.

g. Install the baseplate and the four rubber feet using the appropriate screws and washers.

h. Set the centrifuge on its feet and plug in the power cord.

i. If a new armature and/or new brushes have been installed, run the centrifuge at 2000 rev/min with no rotor for a period of 30 minutes to seat the brushes. Failure to do this will result in immediate brush burn and commutator pitting and will severely limit the life of the new parts.

CAUTION

Do not stone or burnish the commutator as this will increase brush wear and may result in smear metal on the surface of the commutator.

Do not allow the motor to become inoperative by allowing brushes to wear to the point where the brushes do not make contact with the commutator. This causes severe arcing resulting in excessive brush and commutator wear.

Table 4-1. Troubleshooting

NOTE

During troubleshooting, loose or faulty connections must not be overlooked.

PROBLEM	PROBABLE CAUSE	REMEDY
POWER switch is ON but not illuminated and centrifuge will not operate.	1. Faulty power supply.	1. Reset power switch. On 50 Hz instruments check transformer inline fuse.
	2. Centrifuge circuit overloaded.	2. Reset power switch. On 50 Hz instruments check transformer inline fuse.
	3. Faulty POWER switch.	3. Replace switch.
	4. Faulty power transformer (if 220 Vac supply).	4. Replace transformer.
Motor operates but rotor remains stationary.	Sheared drive coupling.	Check upper and lower couplings on gyro drive and replace as necessary.
POWER switch is ON, ANGULAR VELOCITY and TIME controls are set, and latch locks but motor will not start.	1. Faulty TIME control.	1. Check control and set to HOLD or to timed run. Replace if necessary.
	2. Closed unbalance switch.	2. Rock gyro drive shaft back and forth and readjust switch. Replace switch if necessary.
	3. Misadjustment or faulty lid lock latch mechanism.	3. Adjust or replace latch mechanism.
Motor runs but tachometer does not operate.	1. Faulty tachometer.	1. Check full scale deflections (1 mA). Replace if necessary.
	2. Faulty tachometer circuit.	2. Replace printed circuit card.
	3. Faulty tachometer sensor.	3. Replace tachometer sensor.
	4. Tachometer air-gap out of adjustment.	4. Adjust air-gap and secure.
Motor spins to maximum "speed" regardless of ANGULAR VELOCITY control setting.	1. Faulty "speed" control.	1. Replace control.
	2. Shorted motor field coil.	2. Repair or replace motor.
	3. "Speed" control out of adjustment.	3. Adjust "speed" control.

TROUBLESHOOTING (continued)

PROBLEM	PROBABLE CAUSE	REMEDY
Poor braking.	1. Worn or binding brushes.	1. Replace brushes.
	2. Dirty commutator.	2. Clean or repair motor.
	3. Faulty connection.	3. Locate and repair.
Centrifuge motor will not stop when timer turns to 0.	Faulty timer.	Replace timer.
Motor stops but latch will not unlock.	1. Faulty lid latch mechanism.	1. Replace latch mechanism.
	2. Loose or broken cable.	2. Inspect cable and tighten or replace as necessary.
	3. Faulty zero "speed" circuit on printed circuit card.	3. Replace card.
	4. Faulty control relay.	4. Replace relay.
POWER switch is ON, TIME control is set, and cover is latched but motor will not start.	1. Faulty control relay.	1. Replace relay.
	2. Faulty "speed" control.	2. Replace "speed" control.
	3. Faulty motor.	3. Check brushes and commutator and replace or repair as necessary.
Motor will not brake	Faulty BRAKE switch.	Inspect switch and replace if necessary.
Centrifuge makes rasping noises.	1. Faulty motor brushes.	1. Check and replace brushes.
	2. Faulty motor and/or gyro bearings.	2. Check motor and gyro drive by spinning. Replace bearings as necessary.
	3. Faulty drive coupling.	3. Repair or replace drive.
Centrifuge will not come up to "speed", circuit breaker trips.	1. Faulty motor.	1. Replace motor.
	2. "Overspeed" setting incorrect.	2. Recalibrate "overspeed" trip circuit.
Abnormal wear of brushes.	1. Worn commutator.	1,2,3. Repair or replace motor armature.
	2. Defective Armature.	
	3. Improper Maintenance.	3. Provide preventive maintenance on motor.

Section 5 PARTS LIST

5-1. GENERAL

This section lists the parts which Du Pont considers practical to stock and supply for replacement. Table 5-1 lists the parts by major assembly and subassembly. Included are item numbers referencing to figure 5-1, part numbers, and descriptions.

5-2. INDENTATION

Parts in these lists are indented to indicate item relationships. The following is an example of the indentation system used in the description column.

Assembly and/or component

- Detail Part or Subassembly of Assembly and/or Component
- Attaching Hardware (if applicable) for Detail Part or Subassembly
- • Parts of Detail Part or Subassembly
- • Attaching Hardware (if applicable) for Parts

Attaching Hardware (if applicable) for Assembly or Component

Normally, only special attaching hardware is listed. Except for any special item, all hardware is stainless steel in standard sizes that can be obtained locally.

Table 5-1. Parts List for GLC-3 General Laboratory Centrifuge

Item No.	Part No.	Description
		CONTROL COMPONENTS:
1	06294	Instrument Panel Assembly, 60 Hz
1	06299	Instrument Panel Assembly, 50 Hz
2	06023	• Timer Assembly, 60 Hz
2	06029	• Timer Assembly, 50 Hz
	62127	• Knob, Timer
3	66161	• Tachometer Indicator
4	06323	• ANGULAR VELOCITY Control Assembly
5	66159	• Circuit Breaker, Lighted
6	66158	• Switch, Brake
		COVER AND GUARD COMPONENTS:
7	06188	• Lid Assembly
8	06204	• Guard Subassembly
9	06313	• Lid Lock Actuating Assembly
10	06143	• Lock Boot
11	06142	• Helical Torsion Spring
12	06186	• Pin Hinge
13	06190	• Latch Assembly

Table 5-1. Parts List for GLC-3 General Laboratory Centrifuge (continued)

Item No.	Part No.	Description
		ELECTRICAL CIRCUIT COMPONENTS:
14	06342	• Printed Circuit Board Assembly
15	06268	• Transformer Assembly (220 Vac Models Only)
		MOTOR AND RELATED COMPONENTS:
16	06175	• Motor Assembly with Pulse Generator
17	06115	• Support, Motor
18	25015	• Retaining Plate
19	25238	• Lower Coupling Assembly
20	61926	• Cap, Brush Holder
21	61924	• Carbon Brush Assembly
	12113	• Motor Armature with bearings
		GYRO AND RELATED COMPONENTS:
22	06347	• Gyro Action Drive Assembly
23	06348	• Cartridge Assembly
24	06199	• Seal, Gyro Action Drive
25	06107	• Microswitch Subassembly, Unbalance
26	66208	• Cooling Fan
27	66209	• Screen

5-3. PARTS ORDERING INFORMATION

To obtain replacement parts, contact any of the offices listed below and include the part number and description. To ensure that you receive the correct part for your instrument, be sure you include the instrument type or number and its serial and/or model number.

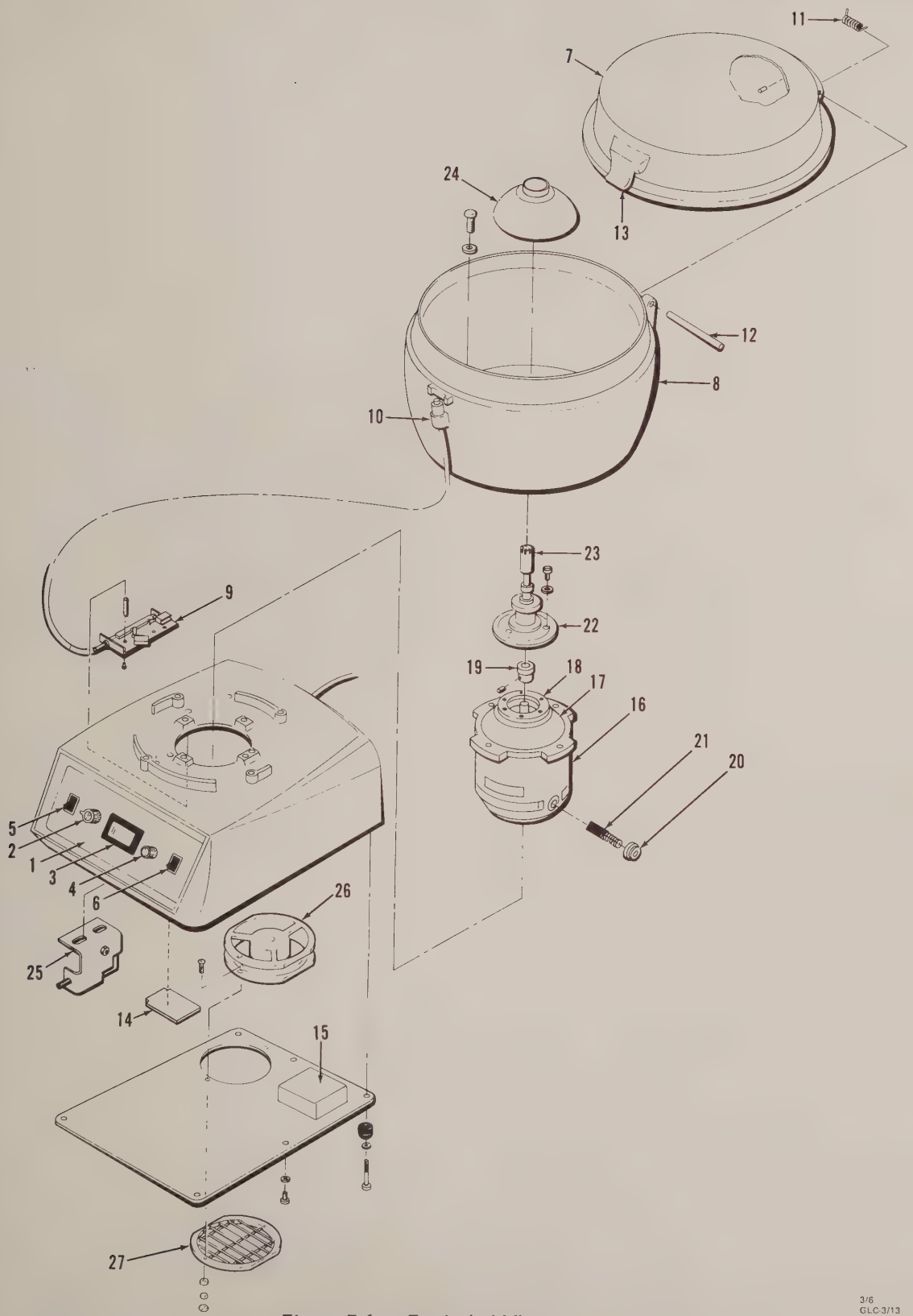


Figure 5-1. Exploded View

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GLC-3/13

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DECONTAMINATION CERTIFICATE

Instructions on the reverse of this card must be completed before field service or the return of the instrument or part to the Du Pont/Sorvall service facility.

NAME _____ DEPARTMENT _____

INSTITUTION _____ ADDRESS _____

CITY _____ STATE _____ ZIP _____

INSTRUMENT _____ SERIAL NUMBER _____

ROTOR _____ SERIAL NUMBER _____

PART _____ PART NUMBER _____

CONTAMINATE USED _____

DECONTAMINATION CERTIFIED BY _____

DATE DECONTAMINATED _____

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DECONTAMINATION CERTIFIED BY _____

DATE DECONTAMINATED _____

INSTRUCTIONS

When an instrument that has been used with radioactive or pathogenic material requires servicing by Du Pont personnel either at the customer's laboratory or at Du Pont facilities, the following procedure must be complied with to insure safety of our personnel:

1. The instrument or part to be serviced shall be cleaned of all blood and other encrusted material and decontaminated prior to servicing by our representative. No radioactivity shall be detectable by survey equipment.
2. A Decontamination Information Certificate (Du Pont Instruments Form No. IPDP-59) shall be completed and attached to the instrument or part.

If an instrument or part to be serviced does not have a Decontamination Information Certificate attached to it, and, in our opinion, the instrument or part presents a potential radioactive or biological hazard, our representative will not service the equipment until proper decontamination and certification has been completed. If an instrument is received at our Service facilities and, in our opinion, is a radioactive or biological hazard, the sender will be contacted for instructions as to disposition of the equipment. Disposition costs will be borne by the sender.

Decontamination Information Certificates are included with these Operation Instructions. Additional certificates are available from your local technical or customer service representative. In the event these certificates are not available, a written statement certifying that the instrument or part has been properly decontaminated and outlining the procedures used will be acceptable.

NOTE

Service representatives will indicate on a Customer Service Repair Report if decontamination was required, and if so, what the contaminate was and what procedure was used. If no decontamination was required, it should be so stated.

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